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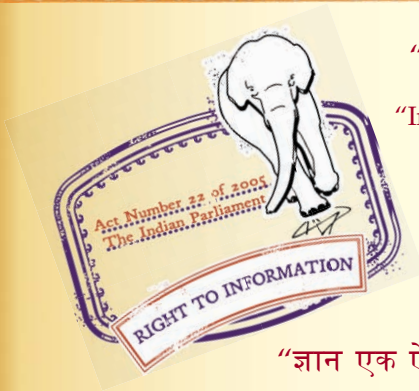
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IS 10357 (1990): General Purpose Furnace [Gpf (N-660)]
Carbon Black [PCD 13: Rubber and Rubber Products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**GENERAL PURPOSE FURNACE [GPF (N-660)]
CARBON BLACK — SPECIFICATION**

(First Revision)

भारतीय मानक

**सामान्य प्रयोजनार्थ भट्टी [जी पी एफ (एन-660)] काला कार्बन — विशिष्ट
(पहला पुनरीक्षण)**

UDC 661'666'4 : 678'4'046'2

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**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 10 January 1990, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Carbon blacks are added to rubber to develop physical strength properties and are, therefore, commonly known as reinforcing agents.

This standard covers the requirement of general purpose furnace carbon black which has been given the nomenclature of N-660 by American Society for Testing and Materials.

This standard was first published in 1982. In this revision, Industry Reference Black (IRB) No. 6 has been included as reference black instead of IRB No. 4 for measuring physical properties of the vulcanizate. Also, the requirements for loss on heating, ash content and discolouration of toluene have been modified.

This standard contains clauses 4.2 and 4.4 which call for agreement between the purchaser and the supplier.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GENERAL PURPOSE FURNACE [GPF (N-660)] CARBON BLACK — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for general purpose furnace [GPF (N-660)] carbon black for use in rubber industry.

2 REFERENCES

2.1 The Indian Standards given in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, definitions given in IS 7503 (Parts 1 to 4) shall apply.

4 REQUIREMENTS

4.1 The material shall be free from foreign matter like wood, metal and fibres.

4.2 Pelletization

The material shall be delivered in the pelletized form. Pellet hardness shall be controlled to such a degree that satisfactory dispersion is obtained when compounded in standard mixing equipment as desired by the purchaser.

4.3 The material shall also comply with the requirements given in Table 1.

4.4 Compounding

If desired by the purchaser the material may be compounded in natural rubber test recipe following the procedure given in Annex B and the properties of carbon black assessed relative to IRB No. 6.

5 PACKING AND MARKING

5.1 Packing

The material shall be supplied in bags. The net mass of each bag shall be 25 ± 0.5 kg. The bags shall be shaped to facilitate stacking in pellets by slight ironing.

5.2 Marking

The packages shall be marked with the identification of the source of manufacture, net mass,

month and year of manufacture, batch number; grade identification; and shall have grey colour as a colour code identification.

**Table 1 Requirements for General Purpose
Furnace [GPF (N-660)] Carbon Black**

(Clause 4.3)

Sl No,	Characteristic	Requirement	Method of Test, Ref to Cl No. of IS 7498 : 1985
(1)	(2)	(3)	(4)
i)	Iodine absorption, as mg of iodine/g of carbon black	30 to 40	5
ii)	Dibutyl phthalate (DBP) absorption ml/100 g of carbon black	86 to 96	6
iii)	Pour density, g/l	385 to 450	7
iv)	Sieve residue, percent by mass, <i>Max</i>		8
	a) On 45-micron IS Sieve	0.100 0	
	b) On 500-micron IS Sieve	0.001 0	
v)	Loss on heating, percent by mass, <i>Max</i>	1.0	9
vi)	Ash content, percent by mass, <i>Max</i>	0.50	10
vii)	Fines content, percent by mass, <i>Max</i>	15	13
viii)	Discolouration of toluene, percent transmission, <i>Min</i>	75	16

6 SAMPLING, NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

6.1 Sampling

The sampling of carbon black shall be done in accordance with IS 7498 : 1985.

6.2 Number of Tests and Criteria for Conformity

All the characteristics of GPF carbon black given in Table 1 shall be tested on individual samples.

The lot shall be declared as conforming to the requirements of the specification if all the test results of each of the individual samples satisfy the corresponding requirements.

ANNEX A

(Clause 2.1)

LIST OF INDIAN STANDARDS REFERRED

IS No.	Title	IS No.	Title
1675 : 1971	Stearic acid, technical (<i>first revision</i>)	7503 :	Glossary of terms used in rubber industry
3399 : 1973	Zinc oxide for rubber industry (<i>first revision</i>)	Part 1 : 1988	Basic terms
3400 (Part 1) : 1987	Methods of test for vulcanized rubbers: Part 1 Tensile stress-strain properties (<i>second revision</i>)	Part 2 : 1988	Definitions of additive (<i>first revision</i>)
4588 : 1986	Rubber, raw natural (<i>third revision</i>)	Part 3 : 1988	Definitions relating to properties and testing (<i>first revision</i>)
7498 : 1985	Methods of sampling and test for carbon black (<i>first revision</i>)	Part 4 : 1988	Definitions relating to processing (<i>first revision</i>)
		8483 : 1989	Dibenzothiazyl disulphide (<i>first revision</i>)
		8851 : 1978	Sulphur for rubber industry

ANNEX B

(Clause 4.4)

SCHEDULE FOR COMPOUNDING AND TESTING FOR PHYSICAL EVALUATION OF CARBON BLACK

B-1 GENERAL

B-1.1 These procedures involve the incorporation of the black to be tested in rubber along with the necessary auxiliary agents, to permit vulcanization, followed by testing. Along with each test black, a corresponding stock containing the Industry Reference Black No. 6 is included. The differences between the properties obtained on the reference black is simply a device to cancel the inevitable variations in test results which are due to minor variations between laboratories in equipment, materials, procedures and ambient conditions.

B-2 STANDARD NATURAL RUBBER COMPOUNDING FORMULATION

B-2.1 The standard formulation for testing carbon black is given below:

Material	Parts by Mass
Natural rubber grade ISNR : 5 (see IS 4588 : 1986)	100
Zinc oxide (see IS 3399 : 1973)	5

Material

Parts by Mass

Stearic acid (see IS 1675 : 1975)	3
Dibenzothiazyl disulphide (see IS 8483 : 1989)	0.6
Sulphur (see IS 8851 : 1978)	2.5
Carbon Black GPF (N-660)	50

B-3 MIXING METHOD

B-3.1 The mixing method is given in B-3.1.1 to B-3.1.10.

B-3.1.1 Use a two roll laboratory mill having 150 mm outside diameter and 250 to 280 mm working distance between the guides. The speed of slow roll should be 24 ± 0.5 rev/min and the friction ratio should be 1 to 1.4. Adjust and maintain roll temperature at $70 \pm 5^\circ\text{C}$ and set mill opening 1.4.

B-3.1.2 The carbon black shall be conditioned before weighing, by heating in an oven at 100 to 110°C for 1 hour.

B-3.1.3 Weigh the ingredients for a batch size which is 4 times of the parts by mass in g given in B-2.1.

B-3.1.4 Add rubber and band on mill, make two 3/4th cut from each side (time 2'0 minutes).

B-3.1.5 Set mill opening at 1'65 mm and add stearic acid and 3/4th cut once each way (time 2'5 minutes).

B-3.1.6 Add sulphur, accelerator, zinc oxide and make 3/4th cut twice each way (time 2 minutes).

B-3.1.7 Add carbon black. Open mill gradually to maintain constant bank. 3/4th cut three times each way after all carbon black is in (time 7'5 minutes).

B-3.1.8 Cut stock, roll and weigh, if the mass of the mixed batch is beyond the tolerance of ± 0.6 percent, reject the batch (time 1 minute).

B-3.1.9 Pass end-wise six times at 0'8 mm opening, and sheet off at 2'2 mm finished gauge (time 2'5 minutes).

B-3.1.10 Condition the stock for 1 to 24 hours at a temperature of $27 \pm 2^\circ\text{C}$ and cut out suitable slabs for vulcanization.

B-4 VULCANIZATION

B-4.1 The test pieces are vulcanized for 15 and 30 minutes at 145°C in a standard 4-cavity mould which gives sheets of dimensions $150 \times 150 \times 2$

mm. The curing press shall be capable of exerting a minimum pressure of 3.5 MN/m^2 (approx 35 kgf/cm^2) on the cavity areas of the mould during vulcanization. After vulcanization, the sheets shall be cooled immediately in water. Condition the vulcanized test slab for 16 hours to 72 hours at $27 \pm 2^\circ\text{C}$ before testing.

B-5 TESTING

B-5.1 The vulcanized sheets are tested for 300 percent modulus, and tensile strength in accordance with IS 3400 (Part 1) : 1987.

B-6 PHYSICAL PROPERTIES

B-6.1 The maximum difference in physical properties of vulcanizates containing GPF carbon black as compared to IRB No. 6 shall be as given in Table 2.

Table 2 Difference in Physical Properties of Vulcanizates Containing GPF Carbon Black from IRB No. 6

(Clause B-6.1)

Sl Cured Conditions No.	Tensile Strength, <i>Min</i> MPa*	300 Percent Modulus MPa*
i) 15 min at 145°C	-4.5	-2.0 to +1.0
ii) 30 min at 145°C	-5.0	-1.8 to +1.2

*1 MPa=approx 10.2 kgf/cm^2

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Amendments Issued Since Publication

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**AMENDMENT NO. 1 APRIL 2003
TO
IS 10357 : 1990 GENERAL PURPOSE
FURNACE [GPF(N-660)] CARBON
BLACK — SPECIFICATION**

(First Revision)

[Page 1, Table 1, Sl No. (i), col 2] — Substitute 'Iodine adsorption' for 'Iodine absorption'.

(Page 1, clause 4.4, line 5) — Substitute 'IRB No. 7' for 'IRB No. 6'.

(Page 2, clause B-1.1, line 6) — Substitute 'Industry Reference Black No. 7' for 'Industry Reference Black No. 6'.

(Page 3, clause B-4.1, line 1) — Substitute '30 minutes' for '15 and 30 minutes'.

(Page 3, clause B-6.1, line 3) — Substitute 'IRB No. 7' for 'IRB No. 6'.

(Page 3, Table 2) — Substitute the following for the existing:

**Table 2 Difference in Physical Properties of Vulcanizates Containing
GPF Carbon Black from IRB No. 7**

(Clause B-6.1)

Cure Conditions	Tensile Strength Min, MPa*	300 Percent Modulus, MPa*
(1)	(2)	(3)
30 min at 145°C	-6.5	-4.95 to -1.95

*1 MPa = approximately 10.2 kgf/cm².

(PCD 13)